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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
SHAH, PARAS D	

ART UNIT	PAPER NUMBER
2626	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/647,586	SELTZER ET AL.	
	Examiner	Art Unit	
	Paras Shah	2626	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05/04/2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-25* is/are rejected.

7)☐ Claim(s) \ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This Office Action is in response to the Amendment filed on 05/04/2007. Claims 1-25 remain pending. The Applicants' amendment and remarks have been carefully considered, but they are not persuasive and do not place the claims in condition for allowance. Accordingly, this action has been made FINAL.

2. All previous objections and rejections directed to the Applicant's disclosure and claims not discussed in this Office Action have been withdrawn by the Examiner.

Change of Art Units

3. It should be note that the Examiner has changed art units, which was formerly 2609. The Examiner's new art unit is 2626.

Response to Arguments

4. Applicant's arguments (pages 6-12) filed on 04/09/2007 with regard to claims 1-25 have been fully considered but they are not persuasive.

As to claims 1 and 13, in response to applicant's arguments, the recitation "noise-reduced value representing a portion of a noise-reduced speech signal" has not been given patentable weight because the recitation occurs in the preamble. A preamble is generally not accorded any patentable weight where it merely recites the purpose of a process or the intended use of a structure, and where the body of the claim does not depend on the preamble for completeness but, instead, the process steps or structural limitations are able to stand alone. See *In re Hirao*, 535 F.2d 67, 190 USPQ 15 (CCPA

1976) and *Kropa v. Robie*, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951). Further, it should be noted that the Applicants argue that Laroche is using the harmonics plus noise model for speech synthesis. The Examiner traverses this argument since the Applicants are using a similar technique for estimating the noisy component and the harmonic component of the noisy speech signals as shown in pages 14 and 15 of the Applicant's Specification. Further, the Applicants argue that the signal presented in Laroche does not represent a noise-reduced value. The Examiner traverses this argument since it is inherent that the background noise (see Laroche, page 4, sect. 6, lines 5-6) will be reduced and thus a noise reduced value of the harmonics and noise is outputted.

As to claim 2, the Applicants argue that the Laroche prior art does not show the multiplying of the harmonic component by a scaling parameter. The Examiner traverses the arguments by citing equation 1. It is evident from equation 1 that the exponential, which is the harmonically related sinusoidal components. The sum of these harmonic sinusoidal components is the harmonic component. The multiplication of the harmonic component by the parameter is done through the multiplication of the individual harmonic sinusoids. Further, the multiplication of the parameters before the summing or after the summing is equivalent since the A_k could have been factored out and multiplied later as a vector.

As to claims 4, 5, and 20, the Applicants arguments with respect to the harmonics to noisy speech signal ratio has been considered persuasive. Hence, a new reference by Gao (US 2002/0035479) is cited to teach the stated limitations. The

reference discloses a noise to signal ratio subtracted by one, which is equivalent to the harmonics to noisy signal ratio presented by the Applicants.

As to claims 7 and17, the Applicant's ague that the combination of the Laroche and Seltzer reference would be destructive. The Examiner traverses this argument as no evidence is provided by the Applicants that would make the result destructive. Hence the rejection is maintained.

As to claim 8, the Applicants argue that the scaling parameter shown in the pervious Office Action was unclear and where the pre-multiplied value was obtained. The Examiner states that the multiplying of the parameter to the harmonics or the multiplication of the scaling parameter after the Mel coefficients is found from the harmonics are equivalent. The scaling parameter is the A_k value shown in claim 1. Further, the motivation to have combined the two references was stated in the rejection for claim 7 for recognizing the synthesized speech created from claim 1.

5. Applicant's arguments with respect to claims 1-25 have been considered but are moot in view of the new ground(s) of rejection.

Response to Amendment

6. Applicants' amendments filed on 05/04//2007 have been fully considered. The newly amended limitations in claims 1 and 13 necessitate new grounds of rejection. The prior art reference by Gao (US 2002/0035479) has been applied to teach the "noise reduced value relative to the noisy speech signal".

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 1-6, 11-16, and 18-24 rejected under 35 U.S.C. 103(a) as being unpatentable over by Laroche *et al.* ("HNM: A Simple Efficient Harmonic and Noise Model for Speech" 1993) in view of Gao (US 2002/0035470).

As to claims 1, 13, and 19 Laroche *et al.* discloses a method of identifying an estimate for a noise reduced value representing a noise-reduced speech signal, the method comprising:

decomposing a portion of a noisy speech signal (see page 1, left column, sect. 1, line 2-3) into a harmonic component (see page 1, left column, sect. 1, line 2) and a random component (see page 1, left column, sect. 1, line 2-3) (e.g. It should be noted that noise contained in speech is non-periodic and is random);

determining a **scaling parameter (see page 1, right column, sect. 2, 1st paragraph, equation 1)** for at least the **harmonic component (see page 1, left column, sect. 2, 1st paragraph, and equation 1)** (summation of the harmonic sinusoid components);

multiplying the harmonic component by the **scaling parameter** for the harmonic component to form a **scaled harmonic component (see equation 1)**

(e.g. It is inherent that once the amplitude, fundamental frequency, and pitch harmonic parameters are obtained the result will yield a scaled result as seen by the term A_k in equation 2, which is used to complete equation 1. Further, the multiplication of the harmonic component by the parameter is done through the multiplication of the individual harmonic sinusoids. The multiplication of the parameters before the summing or after the summing is equivalent since the A_k could have been factored out and multiplied later as a vector);

multiplying the random component by a scaling parameter for the random component to form a scaled random component (see equation 2) (e.g. It is evident from the stated equation that there is two scaling components, one is a windowing function and the other is a normalized all pole filter. The equation represents the stochastic component, which is a random component); and

summing the scaled harmonic component and the scaled random component to form the noise-reduced value (see page 3, right column, sect. 4, lines 6-8) (e.g. It is inherent that the synthetic signal is formed by the harmonic component and the random component from equation 1 and 2).

However, Laroche does not specifically disclose the reduced noise relative to the portion of the noisy speech signal.

Gao does disclose the **reduction of noise relative to the noisy speech signal (see page 2, [0025], lines 8-12)** (e.g. the reduction of the background noise is done through the use of a gain factor. The signal originally contained background noise in the speech.

It would have been obvious to one of ordinary skilled in the art at the time the invention was made to have modified the estimation of a noise reduced speech signal presented by Laroche with the reduction of noise relative to the noisy speech signal. The motivation to have combined the two references involves the improvement in the quality of the voice signal (see page 2, [0021]).

As to claims 2,14, and 18 Laroche *et al.* discloses wherein decomposing a portion of a noisy speech signal comprises

modeling **the harmonic component** as **a sum of harmonic sinusoids** (see page 1, right column, sect. 1, lines 1-3 and equation 1) (e.g. It is apparent that equation 1 can be put in terms of cosine and sine using Euler's Relation. Also, the multiplication of the harmonic component by the parameter is done through the multiplication of the individual harmonic sinusoids. Further, the multiplication of the parameters before the summing or after the summing is equivalent since the A_k could have been factored out and multiplied later as a vector.

As to claims 3 and 15, Laroche *et al.* discloses wherein decomposing a portion of a noisy speech signal further comprises

determining a least-squares solution to identify the harmonic component (see page 2, left column, sect. 3, 2nd paragraph, lines 1-5) (e.g. It should be

noted that a least squares method is used to estimate the parameters to obtain the harmonic component. The voiced segment is the harmonic component).

As to claims 4, 5 and 20, Laroche *et al.* does not specifically disclose the determining of the scaling parameter from the ratio of the energy of the harmonic component to the noisy speech signal.

Gao does disclose a gain factor determined from a the **ratio of the harmonic component to the energy of the noisy speech signal (see page 2, left column, [0025] and [0026])** (e.g. From the cited sections, a formula for the gain factor is given. This formula is equivalent to that stated by the Applicants. NSR is defined to be the noise energy divided by the noisy signal energy (speech and noise) as defined in the cited sections. 1-NSR is equivalent to harmonics to noisy signal ratio, 1-N/(S+N) = S+N-N/(S+N)=S/(S+N)).

As to claims 6 and 16, Laroche *et al.* discloses wherein decomposing a portion of a noisy speech signal comprises

decomposing a vector of time samples from a frame (see page 1, right column, sect. 2, line 5-8) of the noisy speech signal into a harmonic component vector of time samples and a random component vector of time samples (e.g. It is inherent that the use of time samples is used as seen by the summation bounds for equation 1. Further, the random signal is obtained from the

subtraction of the original speech signal by the harmonic part, which is also a specific time sample size).

As to claims 11 and 24, Laroche *et al.* discloses where the noise-reduced value (e.g. also known as the synthesized signal described above)

is used to perform speech recognition (see page 3, right column, sect. 6, line, 1st paragraph, line 2) (e.g. It is apparent that the use of speech enhancement directly relates to speech recognition). The feature vector referred to is described as being the signal representing the noise reduced signal, which is obtained from the steps stated in claim 1.

As to claim 12, Laroche *et al.* discloses

using the noise-reduced value (e.g. also known as the synthesized signal described above) in speech coding (see page 3, right column, sect. 6, line, 1st paragraph, line 2) (e.g. It is apparent that the use of the HNM model for speech enhancement and timbre modification directly relates to speech coding since the intelligibility of the signal is of importance, which relates to the noise component).

As to claim 21, Gao discloses

the scaling value for the harmonic component is separately determined for each time in segment of the noisy speech signal (see page 2, left column, [0025])

(e.g. The NSR value is frame based and hence it is determined separately for each segment in time.)

As to claims 22 and 23, Laroche *et al.* discloses

multiplying the random component by a scaling value for the random component to form a scaled random component (see equation 2 and equation 9) (e.g. It is evident from the stated equation that there is two scaling components, one is a windowing function and the other is a normalized all pole filter) (From equation 9, it is evident that the equation can be modified to account for specific time intervals as denoted by t_i).

9. Claims 7-10, 17, and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Laroche *et al.* in view of Gao as applied to claims 6, 16, and 24 above, and further in view of Seltzer (CMU Speech Group 1999).

As to claims 7 and 17, Laroche *et al.* does not specifically disclose the determining of the Mel spectrum for the harmonic component from the harmonic component vector of samples.

Seltzer does disclose the determination of the Mel spectrum from a speech signal (see page 1,sect. 2, Block Diagram).

It would have been obvious to one of ordinary skilled in the art to have modified the harmonic plus noise model presented by Laroche *et al.* by that of Seltzer to find the Mel Spectrum. The motivation to combine the two involves the

extraction of features from the speech signal. The Mel spectrum also enables the detection of voiced segments allows the frequency amplitudes to be seen. The speech signal in this case is the synthesized harmonic component. This method is commonly used in speech recognition systems.

As to claim 8, Laroche *et al.* discloses the multiplication of the harmonic component by the scaling parameter.

However, Laroche does not specifically disclose the multiplication of the Mel Spectrum for the harmonic component with the scaling factor.

Seltzer does disclose the calculation of the Mel Spectrum (see Page 2, sect. 4d., see equation) by the harmonic component with the scaling factor pre-multiplied from an input speech signal. The speech signal in this case is the harmonic component that was modeled.

The multiplication of the scaling factor could have been pre-multiplied as the frequency content of the signal will not change, but rather the amplitude. However, since the scaling factor applies to all frequency components, the scaling factor can be also multiplied after the Mel Spectrum is obtained, which will allow the same result to be obtained. The multiplying of the scaling parameter to the harmonics or the multiplication of the scaling parameter after the Mel coefficients is found from the harmonics is equivalent. The scaling parameter is the A_k value shown in claim 1. Further, the motivation to have combined the two

references was stated in the rejection for claim 7 for recognizing the synthesized speech created from claim 1.

As to claims 9,10 and 25, Laroche *et al.* does not specifically disclose the forming of the Mel Frequency Cepstral Coefficients.

Seltzer discloses the forming of Mel Frequency Cepstral Coefficients feature vector (see Page 3, sect. 4e, equation) from a speech signal for speech recognition (page 1, sect. 1, line 1). This is found from the Mel Spectrum.

Conclusion

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Chandran *et al.* is cited to disclose the calculation of NSR enhancing the quality of the communication signal.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Paras Shah whose telephone number is (571)270-1650. The examiner can normally be reached on MON.-THURS. 7:30a.m.-4:00p.m. EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Edouard can be reached on (571)272-7603. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

PATRICK N. EDOUARD
SUPERVISORY PATENT EXAMINER

P.S.